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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/762,114	01/21/2004	Peter L. Kellerman	02-IMP-005	3916
29393	7590	07/19/2006	EXAMINER	
ESCHWEILER & ASSOCIATES, LLC NATIONAL CITY BANK BUILDING 629 EUCLID AVE., SUITE 1210 CLEVELAND, OH 44114			DHINGRA, RAKESH KUMAR	
			ART UNIT	PAPER NUMBER
			1763	

DATE MAILED: 07/19/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

4

Office Action Summary	Application No. 10/762,114	Applicant(s) KELLERMAN ET AL.	
	Examiner Rakesh K. Dhingra	Art Unit 1763	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 03 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 08 May 2006.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1, 10-18, 38-41, 45 and 54-61 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1, 10-18, 38-41, 45 and 54-61 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Response to Arguments

Applicant's arguments, see pages 15-23 filed 05/8/06, with respect to the rejection(s) of claim(s) 1, 10-18, 38-41, 45, and 54-61 under 35 USC 102 (b) and 35 USC 103 (a) have been fully considered and are persuasive. Therefore, the rejection has been withdrawn. However, upon further consideration, a new ground(s) of rejection is made as explained hereunder.

New references have been found (Ennis – US Patent No. 3,908,183 and Murrell et al – US PG PUB No. 2003/0197129) that when combined read on limitations of claims 1, 45. Accordingly claims 1, 45 have been rejected under 35 USC 103 (a) as explained below. Further, claim 38 and remaining dependent claims 10-18, 39-41 and 54-61 have also been rejected under 35 USC 103 (a) as explained below.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1, 45 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ennis (US patent No. 3,908,183) in view of Murrell et al (US PG PUB No. 2003/0197129).

Regarding Claims 1,45: Ennis teaches an ion implantation apparatus (Figure 2) that includes a plasma expansion source (formed by collision of electrons from beam 34 with the vaporized atoms of the source material 32) that generates ions for ion

implantation;

screen 43 for ion beam acceleration disposed at the top portion of the ion beam;

a work-piece support structure associated with the top portion of the chamber, and operable to secure the workpiece 11 having an implantation surface orientated facing downward (column 5, line 30 to column 7, line 45).

Ennis does not teach extraction assembly and plasma source that generates source gas ions within the chamber.

Murrell et al teach an ion implantation apparatus (Figures 1-4) comprising of an ionization chamber 32 having a front plate electrode or top 102, in which plasma is generated and extraction electrodes 14a, 14b by which an ion beam 7 is generated which implants the wafer 22 mounted in housing 19. Murrell et al also teach that use of words like "top", "bottom", "side" etc do not necessarily denote the desired or necessary orientation of the ion source apparatus (paragraphs 0009, 0039, 0047, 0052).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to use extraction electrodes as taught by Murrell et al in the apparatus of Ennis to enable extract ions from the ion source at an extraction energy level selected to provide efficient operation of the ion source.

Claims 10-13, 15, 16, 54-56, 58, 59 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ennis (US patent No. 3,908,183) in view of Murrell et al (US PGPUB No. 2003/0197129) as applied to Claim 1 and further in view of Lob et al (US Patent No. 5,036,252).

With respect to Claims 10, 54: Ennis in view of Murrell et al teach all limitations of the claim including plurality of extraction electrodes 14a, 14b and operable to extract the ions vertically from the top of the chamber (Murrell et al – Figure 1).

Murrell et al do not teach plurality of extraction electrodes that are vertically oriented with respect to one another.

Lob discloses an ion beam source (Figures 1, 3) that includes a plasma chamber 1 and an extraction assembly comprising a plurality of extraction electrodes vertically oriented with respect to one another and operable to extract the ions vertically from the top portion of the chamber (Fig 1 Item 6-10 and Column 5, Lines 66-68 and Column 6, Lines 1-4).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to extraction electrode configuration as taught by Lob et al in the apparatus of Ennis in view of Murrell et al to extract and focus the ion beam from the ionization chamber and to accelerate the same for focusing on the wafer surface (column 7, lines 10-20).

Regarding Claims 11, 55: Lob discloses a first extraction electrode (Fig 1 Item 6-10 Column 5 Lines 66-68 and Column 6 Lines 1-4) of the plurality of extraction electrodes is closest to the plasma within the chamber and comprises a plurality of extraction apertures extending there-through (Fig 1 Item 6 Column 5 Lines 66-68 and Column 6 Lines 1-4).

Regarding Claims 12, 56: Lob discloses that the plurality of extraction apertures extends through the first extraction electrode (Fig 1 Item 6-10 Column 5 Lines 66-68

and Column 6 Lines 1-4) collectively have an area associated therewith and wherein a ratio of the area to the total area exposed to plasma defines a transparency, and wherein the transparency is less than 50% (Column 9 Lines 60-68).

Regarding Claim 13: Lob discloses the transparency of the first extraction electrode is about 10% (Column 9 Lines 60-68).

Regarding Claims 15, 58: Lob discloses that the extraction apertures of the first extraction electrode each have an area and wherein extraction apertures of the other extraction electrodes are substantially aligned with the first extraction electrode extraction apertures, respectively (Figures 1, 5 and Column 9 Lines 50-57).

Regarding Claims 16, 59: Lob teaches that extraction apertures of electrode 8 are greater than those of electrode 6. Lob also teaches that apertures in electrode 6 could be made smaller (implying that extraction apertures of electrode 7 could also be greater than that of electrode 6 (column 9, lines 60-68)).

Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ennis (US patent No. 3,908,183) in view of Murrell et al (US PG PUB No. 2003/0197129) and Lob et al (US Patent No. 5,036,252) as applied to Claim 12 and further in view of Okamoto et al (US patent No. 4,963,735).

With respect to Claim 14: Ennis in view of Murrell et al and Lob teach all limitations of the claim except cooling of extraction electrodes.

Okamoto et al discloses an ion beam plasma source (Figures 1, 2b) that includes a discharge tube 10 and extractor electrode 110 that are cooled (column 3, lines 15-35)

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to use cooling of extraction electrode as taught by Okamoto et al in the apparatus of Ennis in view of Murrell et al and Lob to enable control temperature of plasma source and obtain proper focusing of the ion beam.

Claims 17,18, 38-41, 60, 61 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ennis (US patent No. 3,908,183) in view of Murrell et al (US PG PUB No. 2003/0197129) and Lob (US patent No. 5,036,252) as applied to Claims 11, 55 and further in view of Kellogg et al (US patent No. 4,698,236).

Regarding Claims 17, 18, 60,61: Ennis in view of Murrell et al and Lob teach all limitations of the claim except interstitial pumping aperture in extraction electrode.

Kellogg et al teach an ion source apparatus (Figure 1) 10 that includes extractor electrode 24 having interstitial pumping apertures (column 2, lines 60-68). Further size of interstitial pumping apertures would be dependent upon the desired pressure to be maintained in the extraction assembly relative to the plasma chamber.

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to use interstitial pumping apertures in extraction electrode as taught by Kellogg et al in the apparatus of Ennis in view of Murrell et al and Lob to permit differential pumping for maintaining proper vacuum in the chamber 20.

Regarding Claim 38: Lob teaches an ion shower comprising: a plasma source operable to generate oxygen ions within a chamber having a first pressure (Fig 1 Item 1 Column 5 Lines 66-68 and Column 6 Lines 1-4); a workpiece support structure associated with the chamber (Fig 1 Item substrate Column 5 Lines 66-68 and Column 6 Lines 1-4), and

operable to secure a workpiece for implantation thereof; and an extraction assembly disposed between the chamber and the workpiece support structure (Fig 1 Item 6-10 Column 5 Lines 66-68 and Column 6 Lines 1-4), the extraction assembly comprising a plurality of electrodes, wherein a first electrode comprises a plasma electrode having a plurality of extraction apertures associated therewith (Fig 1 Item 6 Column 5 Lines 66-68 and Column 6 Lines 1-4), and a second electrode comprises an extraction electrode biased negatively with respect to the chamber and disposed between the plasma electrode and the workpiece support structure (Fig 1 Item 7 Column 7 Lines 26-52), the extraction electrode having a plurality of extraction apertures substantially aligned with respect to the plasma electrode extraction apertures (Fig 1 Item 6 and 7 Column 9 Lines 50-57).

Further, Kellogg et al teach as explained above; the extraction electrode comprising one or more interstitial pumping apertures operable to reduce a pressure thereat to a second pressure substantially less than the first pressure.

Regarding Claim 39: Lob discloses that the extraction assembly further comprises a ground electrode (Fig 1 Item 10 Column 5 Lines 66-68 and Column 6 Lines 1-4) disposed between the extraction electrode (Fig 1 Item 7 Column 5 Lines 66-68 and Column 6 Lines 1-4) and the workpiece support structure (Fig 1 Item Substrate Column 5 Lines 66-68 and Column 6 Lines 1-4), and wherein the ground electrode is biased at a voltage of the workpiece support structure that is biased negatively with respect to the plasma within the chamber (Fig 1 Item 10 Column 7 Lines 26-52) and further comprising

one or more interstitial pumping apertures operable to reduce a pressure thereat to a second pressure substantially less than the first pressure.

Regarding Claim 40: Lob discloses that the extraction assembly further comprises a suppression electrode (Fig 1 Item 9 Column 5 Lines 66-68 and Column 6 Lines 1-4) disposed between the ground electrode (Fig 1 Item 10 Column 5 Lines 66-68 and Column 6 Lines 1-4) and the extraction electrode (Fig 1 Item 7 Column 5 Lines 66-68 and Column 6 Lines 1-4), the suppression electrode biased negatively with respect to the ground electrode, and operable to prevent electrons local to the workpiece support structure from entering the extraction assembly (Fig 1 Item 9 Column 7 Lines 26-52), wherein the suppression electrode comprises a plurality of extraction apertures substantially aligned to the plasma electrode extraction apertures (Fig 1 Item 6 and 9 Column 9 Lines 50-57). Further, Kellogg et al teach suppression electrode comprising one or more interstitial pumping apertures.

Regarding Claim 41: Lob discloses that the extraction assembly further comprising an auxiliary electrode (Fig 1 Item 8 Column 5 Lines 66-68 and Column 6 Lines 1-4) disposed between the extraction electrode (Fig 1 Item 7 Column 5 Lines 66-68 and Column 6 Lines 1-4) and the suppression electrode (Fig 1 Item 9 Column 5 Lines 66-68 and Column 6 Lines 1-4), wherein the auxiliary electrode is biased negatively with respect to the extraction electrode and positively with respect to the suppression electrode (Fig 1 Item 8 Column 7 Lines 26-52).

Claim 57 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ennis

(US patent No. 3,908,183) in view of Murrell et al (US PG PUB No. 2003/0197129) and Lob et al (US Patent No. 5,036,252) as applied to Claim 56 and further in view of Okamoto et al (US patent No. 4,963,735).

With respect to Claim 57: Ennis in view of Murrell et al and Lob teach all limitations of the claim except cooling of extraction electrodes.

Okamoto et al discloses an ion beam plasma source (Figures 1, 2b) that includes a discharge tube 10 and extractor electrode 110 that are cooled (column 3, lines 15-35). Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to use cooling of extraction electrode as taught by Okamoto et al in the apparatus of Ennis in view of Murrell et al and Lob to enable control temperature of plasma source and obtain proper focusing of the ion beam.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Rakesh K. Dhingra whose telephone number is (571)-272-5959. The examiner can normally be reached on 8:30 -6:00 (Monday - Friday). If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Parviz Hassanzadeh can be reached on (571)-272-1435. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.



Rakesh Dhingra



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